

DEPARTMENT OF ENERGY  
FY 2002 CONGRESSIONAL BUDGET REQUEST

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

NATURAL GAS TECHNOLOGIES

I. **Mission Supporting Goals and Objectives:**

Natural gas consumption in the United States is projected by several leading research organizations to reach or exceed 33 Tcf per year by 2020, increasing from 22 Tcf in 1997 (projections of EIA, GRI, Enron). Reduced emissions targets for greenhouse gases could lead to a 40 Tcf gas market by 2010. Gas will play a key role in the 21<sup>st</sup> century transition to a post-oil economy for transportation fuels. Most of the domestic gas resource base is not yet fully known and is located in such areas as: deep formations, low-permeability sandstones, below basalt formations, hydrates, deep water, and remote areas -- Gulf of Mexico and Alaska.

Federal Roles and Responsibilities: Federal roles and responsibilities in natural gas supply research are to: (1) provide strategic guidance for national energy policy; (2) support efficient and sustainable use of domestic energy resources; (3) protect the environment and public safety; (4) enhance the value of Federal lands (38% of gas production is on Federal lands); (5) enhance global market opportunities for U.S. energy technologies; (6) contribute to U.S. science and technology leadership; (7) apply a unique national perspective to technology development that is independent of company specific and State-specific interests; and (8) ensure the integrity and viability of the Nation's energy infrastructures.

DOE's Role In Gas RD&D: Support national goals to: (1) enhance the efficiency and environmental quality of domestic gas exploration, recovery, and processing operations; (2) focus on high-risk technology that private companies alone won't undertake; (3) provide scientific and technological information and analysis to assist policymakers in their decision making; and (4) contribute to science based improvements in regulations to reduce uncertainties and costs while achieving optimal environmental protection.

The overall goal of the Natural Gas Technologies Program is to improve the Nation's ability to supply, store, transport, distribute, and utilize gas in an economic, efficient, and environmentally beneficial manner. In support of DOE's mission, the program funds activities

I. **Mission Supporting Goals and Objectives:** NATURAL GAS TECHNOLOGIES (Cont'd)

that contribute toward: lowering costs for finding and producing gas; improving the confidence in continued availability of a long-term gas supply, and increasing the efficiency of recovery from existing reservoirs (Exploration and Production); enabling characterization and study of gas hydrates (Gas Hydrates); assuring gas infrastructure reliability, flexibility, and emergency response capability (Infrastructure); improving the quality and utility of natural gas for the consuming public (Emerging Processing Technology); and, developing and ensuring availability of low cost environmental compliance technology, and reducing regulatory barriers to economic and efficient market operations by promoting coordinated and innovative Federal and State regulations (Effective Environmental Protection). Each program area has its own unique mission that contributes to the goals and mission of the overall Natural Gas Technologies Program. The total program will increase the value of the natural gas resource base for gas consumers, for Federal, State, and local governments and for the gas industry. The DOE National Energy Technology Laboratory (NETL) located in Morgantown, West Virginia, Pittsburgh, Pennsylvania, and Tulsa, Oklahoma manages the gas technology program implementation activities.

**Exploration and Production:** The Office of Fossil Energy will continue to fund basic and applied RD&D. Specifically, in the Advanced Drilling Completion, and Stimulation product line funding is requested to: develop and demonstrate a set of tools and techniques that will: (a) result in minimum damage during the drilling, completion, and fracturing stages to particular formations; (b) develop new concepts in drilling; and (c) minimize overall environmental impact of drilling-related operations and waste disposal. In the Advanced Diagnostics & Imaging Systems Program funding is requested to develop and demonstrate advanced imaging and prediction techniques for locating productive areas within low-permeability and fractured reservoirs. In addition, the product line will continue to identify and assess the potential productivity of non-conventional gas reservoirs in priority basins to reduce exploration and production risks. A stripper gas well enhancement sub-program is attempting to extend the productive life of active low rate wells (currently contributing 5% of the domestic gas supply) by continuing an industry-driven consortium to investigate multiple technologies to improve stripper well production. Finally, technology transfer activities will be continued, addressing independent producers via internet, newsletters and workshops.

**Gas Hydrates:** Efforts are underway to ensure safe extraction of conventional oil and gas resources located near hydrate deposits, enable safe and economic production of gas from hydrates and assess their impact on the global carbon cycle.

I. **Mission Supporting Goals and Objectives:** NATURAL GAS TECHNOLOGIES (Cont'd)

**Infrastructure:** Efforts are being directed to enhance energy system reliability with the Nation's natural gas pipelines and gas storage facilities. Advanced technology research projects are directed to ensure the reliability and integrity of transmission and utility distribution pipeline systems, to increase the accuracy of the gas volume and energy content measurement of gas in storage, and to provide science and engineering solutions for the development of gas storage facilities in regions without conventional storage options. Efforts are focused to develop cost-effective technologies and engineering techniques that expand peaking storage capacity to meet gas requirements during high demand periods, to develop real-time storage measurement technologies to reduce uncertainties in storage inventories attributable to storage metering biases, to reduce stress corrosion and cracking on gas transmission and distribution lines, to develop systems capable of detecting third-party damage and external force damage to pipelines, to develop technology to improve the efficiency and environmental controls for reciprocating and turbo compressors, and to undertake research to develop advanced technology capable of determining pipeline wall integrity.

**Effective Environmental Protection:** Funding for environmental research activities will bring credible scientific information and advanced technologies to address the environmental issues that have been identified by industry, and state and federal regulators as highest priority. In FY 2002, the program will focus on detection and control of air emissions from gas equipment and facilities, treatment of produced water to meet environmental standards, remediation of hydrocarbon or produced water contaminated soils, treatment and disposal of wastes containing naturally occurring radioactive materials, and other approaches to manage oil and gas field wastes. The program works to lower the cost of effective environmental protection in these environmental issue areas through a combination of risk assessment, technology development, regulatory streamlining, impact analysis, and facilitating dialogue among the affected parties on ways to balance the need to develop the nation's energy resources with the maintenance of our environmental values.

**Performance Measures:**

- Develop and demonstrate technologies, with near-term commercial potential to double average per-well productivity, that can detect and quantify areas of high fracture density in currently uneconomic low permeability gas reservoirs
- Complete laboratory testing and begin field demonstrations of improved remedial technologies for storage wells that could reduce the cost of deliverability enhancement by 10% per year for the gas storage industry by 2007.
- Develop the world's first microwave-processed drill bit and commercialize composite drill pipe.

I. **Mission Supporting Goals and Objectives:** NATURAL GAS TECHNOLOGIES (Cont'd)

II. A. **Funding Schedule:** NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>\$Change</u>	<u>%Change</u>
Exploration and Production	\$13,893	\$14,221	\$9,350	\$-4,871	-34%
Gas Hydrates	2,887	9,938	4,750	-5,188	-52%
Infrastructure	977	8,110	5,050	-3,060	-38%
Emerging Processing Technology	9,919	10,146	250	-9,896	-98%
Effective Environmental Protection	<u>3,133</u>	<u>2,614</u>	<u>1,600</u>	<u>-1,014</u>	<u>-39%</u>
Total, Natural Gas Technologies	<u>\$30,809</u>	<u>\$45,029</u>	<u>\$21,000</u>	<u>\$-24,029</u>	<u>-53%</u>

II. B. **Laboratory and Facility Funding Schedule:**

	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>\$Change</u>	<u>%Change</u>
Argonne National Lab (East)	\$195	\$75	\$0	\$-75	-100%
Brookhaven National Lab	75	0	0	0	0%
Idaho National Engineering Lab	568	50	0	-50	-100%
Lawrence Berkeley Lab	665	1,355	800	-555	-41%
Lawrence Livermore National Laboratory	434	0	0	0	0%
Los Alamos National Laboratory	715	650	0	-650	-100%
National Energy Technology Laboratory	1,257	1,695	540	-1,155	-68%
Oak Ridge National Lab	135	0	0	0	0%
Pacific Northwest Laboratory	575	850	825	-25	-3%
Sandia National Laboratories	300	589	175	-414	-70%
All Other	<u>25,890</u>	<u>39,765</u>	<u>18,660</u>	<u>-21,105</u>	<u>-53%</u>
Total, Natural Gas Technologies	<u>\$30,809</u>	<u>\$45,029</u>	<u>\$21,000</u>	<u>\$-24,029</u>	<u>-53%</u>

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production	<p>Advanced Drilling, Completion, and Stimulation (DCS): Continue development and field testing of high rate-of-penetration, slimhole, directional, and underbalanced drilling products; and of advanced completion technologies. Continue testing, deployment, and technology transfer of underbalanced drilling technology and minimum formation damage drilling and fracturing. Continue fluid fracture research with the GRI at Oklahoma University. Continue development of a revolutionary drilling system. (\$5,680) (NETL, Oklahoma Univ., Sperry Sun, Drilling Eng'g Assoc., Novatek, Mauer, Tempress, Tech Int., TBD)</p> <p>Advanced Diagnostics and Imaging Systems: Continue research in low-permeability</p>	<p>Advanced Drilling, Completion, and Stimulation (DCS): Continue development and field testing of high rate-of-penetration, slimhole, directional, and underbalanced drilling products; and of advanced completion technologies. Continue testing, deployment, and technology transfer of underbalanced drilling technology and minimum formation damage drilling and fracturing. Continue fluid fracture research with the GRI at Oklahoma University. Continue development of a revolutionary drilling system. (\$5,319) (NETL, Novatek, Mauer, Tempress, ACPT, Tech Int., TBD)</p> <p>Advanced Diagnostics and Imaging Systems: Continue research in low-permeability</p>	<p>Advanced Drilling, Completion, and Stimulation (DCS): Complete development of world's first microwave-processed drill bit as a new drilling concept. Commercialize composite drill pipe in onshore and offshore applications. Conclude field testing of advanced directional mud hammer and commercialization of associated high speed data communications system. Continue development of advanced and underbalanced drilling concepts to reduce cost and footprint and increase capability of drilling industry. Initiate research to integrate deep drilling technologies for field demonstrations in the Rocky Mts. (\$5,309) (NETL, PSU, Novatek, Mauer, Tempress, ACPT, Tech Int., TBD)</p> <p>Advanced Diagnostics and Imaging Systems: Complete testing and validation of natural fracture</p>

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	<p>reservoir field deployment with industry in the Greater Green River and other priority basins. Continue development of diagnostics for imaging and predicting gas in natural fractured reservoirs, conducting advanced geoscience measurements including seismic processing and interpretation, and use of advanced National Laboratory capabilities. Continue analysis of deep gas potential in priority basins. (\$4,896) (NETL, LBL, SNL, ICF, USGS, Marine Board, TBD)</p> <p>Multi NL/Industry Partnership: Support R&amp;D in exploration and production technologies in projects identified by industry partners. (\$685) (National Labs)</p> <p>Secondary Gas Recovery: Continue tests of methodologies in</p>	<p>reservoir field development with industry in priority basins. Continue development of diagnostics for imaging and predicting gas in naturally fractured reservoirs, conducting advanced geoscience measurements including seismic processing and interpretation, and use of advanced National Laboratory capabilities. Continue analysis of deep gas potential in priority basins. (\$5,616) (NETL, LBL, SNL, USGS, Marine Board, ARI, N. Mex. Tech., TBD)</p> <p>Multi NL/Industry Partnership: Support R&amp;D in exploration and production technologies in projects identified by industry partners. (\$998) (National Labs)</p> <p>Secondary Gas Recovery: Continue tests of methodologies in</p>	<p>detection technologies in five major U.S. tight gas basins. Several projects for development and validation of the next generation of fracture detection technologies to reduce dry hole rates will be terminated. Complete a second infill drilling optimization study. Improved recovery solicitation issued in FY 2001 will be scaled back, but not eliminated. Conduct a long-term sustainability of gas supply study in Rocky Mt. basins. (\$2,900) (NETL, GeoSpectrum, ARI, Stanford, LBL, SUNY, SNL, USGS, N. Mex. Tech.)</p> <p>Multi NL/Industry Partnership: No activity. (\$0)</p> <p>Secondary Gas Recovery: Last phase of project will be terminated.</p>

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
	the Appalachian Basin and the offshore Gulf Coast. (\$900) (BEG, WV Consortium)	the Appalachian Basin and the offshore Gulf Coast. (\$798) (BEG, WV Consortium)	(\$0)
Exploration and Production (Cont'd)	<p>Stripper Wells Revitalization: Conduct engineering assessment of wells to determine candidate areas for restimulation tests; test and evaluate via field tests the effect of revitalization efforts to extend the productive life of the well. (\$642) (TBD)</p> <p>Technology Transfer: Support industry led efforts in technology transfer. (\$947) (PTTC)</p> <p>No activity. (\$0)</p>	<p>Stripper Wells Revitalization: Continue engineering assessments of wells to determine candidate areas for restimulation; test and evaluate impact of revitalization techniques on the productive life of wells. (\$748) (TBD)</p> <p>Technology Transfer: Support industry led efforts in technology transfer. (\$599) (PTTC)</p> <p>Arctic Research: Establish an Arctic Research program for peer reviewed research; coordinate research conducted through Fossil Energy and Energy Efficiency; conduct outreach and serve as a liaison between the State and DOE. (\$250 provided from Energy Efficiency appropriation.) (TBD)</p>	<p>Stripper Wells Revitalization: National, industry-driven consortium to investigate multiple technologies to improve stripper well production. (\$500) (PSU)</p> <p>Technology Transfer: Support industry led efforts in technology transfer (\$300) (PTTC)</p> <p>Arctic Research: Continue Arctic Research program for peer reviewed research; coordinate research conducted through Fossil Energy and Energy Efficiency; conduct outreach and serve as a liaison between the State and DOE. (\$247) (TBD)</p>

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
	Provide technical and program management support. (\$143)	Provide technical and program management support. (\$143)	Provide technical and program management support. (\$94)
	\$13,893	\$14,221	\$9,350
Gas Hydrates	Expand resource characterization and seismic survey activities in the onshore and offshore areas. (\$2,857) (TBD)	Continue resource characterization and seismic survey activities in onshore and offshore areas. Work will concentrate on hydrate issues in the Gulf of Mexico and the Alaskan North Slope including safe drilling, seafloor stability, characterization and production. (\$9,838) (U. WY, CMRET, Clarkson, CGS, USGS, NRL, TBD)	Continue characterization of Arctic and offshore hydrate resources. Research in areas that are currently important to the Nation– safety and seafloor stability and hydrates role in global climate change. (\$4,702) (U. of Wyo., CMRET, Clarkson, CGS, USGS, NRL, TBD)
	Provide technical and program management support. (\$30)	Provide technical and program management support. (\$100)	Provide technical and program management support. (\$48)
	\$2,887	\$9,938	\$4,750
Infrastructure	Storage Technology: Continue support to industry for deliverability enhancement, gas measurement and advanced storage concepts. (\$967) (ARI, PNL,	Storage Technology: Continue support to industry for deliverability enhancement, reservoir management, gas metering and measurement, and	Storage Technology: Complete ongoing activities in deliverability enhancement and reservoir management. Continue support to industry for metering and

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Infrastructure (Cont'd)	LLNL, TBD)	advanced storage concepts engineering studies. Initiate proof-of-concept research on large storage capacity alternatives in non reservoir rock for regions of the U.S. without conventional storage options. Accelerate development of short-term, high deliverability storage systems to serve future distributed gas power systems. Develop high deliverability gas storage system model to serve the power generation marketplace. (\$3,134) (ARI, TBD)	measurement, and advanced storage concepts. These activities include development of a direct energy meter for storage applications, and support of large capacity, high deliverability storage in granitic rock. (\$1,500) (ARI, Schlumberger-Holditch, Furness-Newburge, NYSEG, TBD)
	No activity. (\$0)	Infrastructure Technology: Initiate research directed to ensure the reliability of the gas transmission and distribution network and increase the efficiency of the pipeline system, advance development of longer life, high-strength, non-corrosive pipeline materials, develop smart automated inside pipeline inspection sensor systems and repair technology,	Infrastructure Technology: Continue research directed to ensure the reliability and integrity of the gas transmission and distribution network, develop smart automated inside pipeline inspection sensor systems, conduct research on obstacle detection systems for horizontal boring applications for laying distribution pipelines, develop systems capable

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Infrastructure (Cont'd)		conduct research on obstacle detection systems for horizontal boring applications for laying distribution pipelines, develop portable real-time video imaging technology to detect natural gas leaks, develop gas system reliability analysis and distributed resource system integration model. Studies will also be undertaken on the overall reliability of the system in its increasing integration with the electric grid. (\$4,895) (TBD)	of detecting external force damage, develop technology to improve the efficiency for reciprocating and turbo compressors, and develop advance technology capable of determining pipeline wall integrity. (\$3,500) (Awards Pending)
	Provide technical and program management support. (\$10)	Provide technical and program management support. (\$81)	Provide technical and program management support. (\$50)
	\$977	\$8,110	\$5,050
Emerging Processing Technology	Gas-to-Liquids: Monitor and evaluate gas-to-liquids feasibility factors for remote gas in Alaska, Gulf of Mexico and other domestic locations as stand-alone operations and/or with other power or energy conversion technology. Continue basic exploratory research activities	Gas-to-Liquids: Continue process and economic evaluation of GTL conversion options and feasibility studies for remote gas in Alaska, Gulf of Mexico and other domestic locations. Continue exploratory research activities of novel conversion concepts, and support	No Activity. (\$0)

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Emerging Processing Technology (Cont'd)	<p>of novel conversion concepts. Continue cost-shared development of innovative hydrogen plasma pyrolysis and other chemical conversion, and continue scaleup and field testing of small-scale physical conversion technologies for the production of transportable liquids from natural gas. Complete material, seal and reactor development, and preliminary reactor design of novel ceramic membrane technology for enhancing Fischer-Tropsch gas conversion process to produce environmentally superior liquid fuels and hydrogen. Liquids include low emission, high performance motor vehicle fuel blends at competitive costs and suitable for existing as well as advanced engines under development with DOE/EE program support. (\$6,104) (U. of AK-Fairbanks, INEL, LANL-</p>	<p>cost-shared development and field testing of promising chemical and small-scale physical conversion technology innovations. Build and begin test operations of a laboratory-scale, novel ITM-Syngas ceramic membrane reactor to enhance Fischer-Tropsch (FT) gas conversion for environmentally superior liquid fuels and hydrogen. Initiate design and component manufacture for first stage scale-up of ITM syngas ceramic reactor incorporating initial laboratory test results. Continue development and validation of GTL catalysts, reactor and process designs. Accelerate process delineation and development for ultra clean, high performance, gas-derived liquid motor fuel products for the 21<sup>st</sup> Century suitable for deployment in Alaska, the Gulf of Mexico, and other remote sites. (\$6,239) (U.of AK-Fairbanks, LANL-Cryenco,</p>	

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
	Cryenco, LBNL, Air Products, PNL, PSU, CAER, NETL, TBD)	LBL, Air products, PNNL, PSU, CAER, NETL, TBD)	

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Emerging Processing Technology (Cont'd)	Gas Tech Information: Continue support of an international center for information on natural gas technologies. (\$311) (GTI)	Gas Tech Information: Continue support of an international center for information on natural gas technologies. (\$317) (GTI)	Gas Tech Information: Continue support of an international center for information on natural gas technologies. (\$247) (GTI)
	Gas Upgrading: Continue research in low-quality gas upgrading, including development of improved sulfur and CO <sub>2</sub> removal processes and development of advanced concepts of readying high nitrogen unmarketable gas for use. Continue development of advanced hybrid gas separation and dehydration technologies for onshore and offshore applications. Continue multi-strata upgrading and utilization. (\$1,577) (NETL, SNL, MTR, SRI, Texas A&M, Radian, Bend, TBD)	Gas Upgrading: Continue research in low-quality gas upgrading, including development of improved sulfur, CO <sub>2</sub> , water, and nitrogen removal technologies. Continue development of advanced hybrid gas separation and dehydration technologies for onshore and offshore applications. Continue multi-strata upgrading and utilization. (\$1,612) (SNL, NETL, Texas A&M, TBD)	Gas Upgrading: Terminate low-quality gas upgrading activities. (\$0)
	Initiate Phase III of coal mine methane project. (\$1,825) (TBD)	Continue Phase III of coal mine methane projects. (\$1,876) (TBD)	No activity. (\$0)
	Provide technical and program management support. (\$102)	Provide technical and program management support. (\$102)	Provide technical and program management support. (\$3)

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	\$9,919	\$10,146	\$250
Effective Environmental Protection	<p>Program Planning Data Analysis: Continue data collection and the development of analytical tools for program planning, for outreach and technology transfer, including the capability to quantify environmental costs and assess constraints to gas resource recovery, collection and distribution. Continue to perform legislative and regulatory impact analysis related to both upstream and downstream gas environmental issues. (\$425) (ANL, EPA)</p> <p>Technology Development: Continue efforts to develop and demonstrate technologies and methods for improving the economics and environmental performance of all facets of gas supply including methods that enable operators to define options</p>	<p>Program Planning Data Analysis: Continue data collection and the development of analytical tools for program planning, for outreach and technology transfer, including the capability to quantify environmental costs and assess constraints to gas resource recovery, collection and distribution. Continue to perform legislative and regulatory impact analysis related to both upstream and downstream gas environmental issues. (\$424) (TBD)</p> <p>Technology Development: Continue to develop and demonstrate technologies and methods for improving the economics and environmental performance of all facets of gas supply including defining options and costs of alternative</p>	<p>Program Planning Data Analysis: Continue data collection and the development of analytical tools for program planning, for outreach and technology transfer, including the capability to quantify environmental costs and assess constraints to gas resource recovery, collection and distribution. Continue to perform legislative and regulatory impact analysis related to both upstream and downstream gas environmental issues. (\$300) (TBD)</p> <p>Technology Development: Continue efforts to develop and demonstrate technologies and methods for improving the economics and environmental performance of all facets of gas supply. This includes defining options and costs of alternative</p>

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Effective Environmental Protection (Cont'd)	and costs of alternative environmental compliance strategies, application of advanced research and new methods of detecting and controlling air emissions (including particulate matter from gas equipment and facilities). Continue development of treatment and disposal technologies for NORM and other wastes. Continue cooperative efforts to establish scientifically based regulations. (\$1,729) (Greenhill, Natl. Labs, State of Miss., TBD)	environmental compliance strategies, application of advanced research and new methods of detecting and controlling air emissions from gas equipment and facilities. Continue development of treatment and disposal technologies for gas exploration and wastes. Continue cooperative efforts to establish scientifically based regulations. (\$1,725) (Natl. Labs, Waterloo, TBD)	environmental compliance strategies, application of advanced research and new methods of detecting and controlling air emissions from gas equipment and facilities. Emphasize technologies that will improve responsible development of gas resources on public lands, consistent with current multiple-use policies of Federal Land management agencies. Continue development of treatment and disposal technologies for gas exploration and wastes. Continue cooperative efforts to establish scientifically based regulations. (\$984) (Natl. Labs, SNL, WU, TBD)
	Outreach and Technology Transfer: Continue outreach and technology transfer efforts on environmental issues affecting natural gas supply, including compliance efforts with industry, states, and others to identify and	Outreach and Technology Transfer: Continue outreach and technology transfer efforts on environmental issues affecting natural gas supply, including compliance efforts with industry, states, and others to identify and	Outreach and Technology Transfer: Continue outreach and technology transfer efforts on environmental issues affecting natural gas supply, including compliance efforts with industry, states, and others to identify and

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
	address environmental challenges to expanded natural gas production. (\$947) (IOGCC, TBD)	address environmental challenges to expanded natural gas production. (\$439) (TBD)	address environmental challenges to expanded natural gas production. (\$300) (TBD)

III. **Performance Summary**: NATURAL GAS TECHNOLOGIES (Cont'd)

<u>Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>
Effective Environmental Protection (Cont'd)	Provide technical and program management support. (\$32)	Provide technical and program management support. (\$26)	Provide technical and program management support. (\$16)
	\$3,133	\$2,614	\$1,600
Natural Gas Technologies, Total	\$30,809	\$45,029	\$21,000